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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/650,075	08/29/2000	Steven Saban	83-96A	9196

23713 7590 12/31/2002

GREENLEE WINNER AND SULLIVAN P C
5370 MANHATTAN CIRCLE
SUITE 201
BOULDER, CO 80303

EXAMINER

NOGUEROLA, ALEXANDER STEPHAN

ART UNIT	PAPER NUMBER
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1743

DATE MAILED: 12/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/650,075

Applicant(s)

SABAN ET AL.

Examiner

ALEX NOGUEROLA

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 October 2002.
- 2a) ☐ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 34, 36 and 38-68 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 34, 36 and 38-68 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 August 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 08 October 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

Response to Amendment

1. Applicant's amendment of October 08, 2002 does not render the application allowable.

Response to Arguments

2. Applicant's arguments filed October 08, 2002 have been fully considered but they are not persuasive.

Objection to the Drawing

The objection to the Drawings is withdrawn.

Double Patenting Rejections

Applicant argues for withdrawal of the double patenting rejections because "the claims rejected under the doctrine of double patenting are claims that were subject to a restriction requirement in the parent case." The Examiner has decided to essentially maintain the double patenting rejections for three reasons. First, in the parent application Applicant elected, with traverse, the invention of Group I, claims 1-8 and 27-31, which included *both* apparatus claims and claims directed to *methods for using the apparatus* (see Office action of December 24, 1998 in 08/963,678; original claims 29-31 in 08/963,678; and claims 29-34 which issued in

Art Unit: 1743

US 6,110,354 from 08/963,678). Applicant has not shown that the original method claims of the instant application (or the amended method claims) belong to a patentably distinct method from the methods of the elected claim group in the parent application.

Second, as mentioned in the previous paragraph Applicant traversed the restriction requirement in the parent application (page 9 of the amendment to 08/963,678 of June 24, 1999 and pages 4 and 11 of the amendment of November 18, 1999). The Examiner of the parent application agreed to Applicant's rejoinder request and rejoined the restricted claims in the Office action of May 15, 2000. So, even if Applicant establishes that the method claims of the instant application belong to the non-elected claims of the parent application the point is moot because Applicant argued that the non-elected claims were in fact not patentably distinct and the Examiner agreed. In effect there was no restriction requirement because it was negated upon Applicant's request (MPEP 804.01(E)).

Last, the claims in the instant application are not consonant with the restriction requirement made by the Examiner of the parent application since the divisional application includes additional claims not consonant in scope to the original claims subject to restriction in the parent (MPEP 804.01(B)). For example, claim 41 of the instant application requires measuring electrical current flowing through the sensor; however, non-elected Group II (claims 21-26) of the parent application did not require measuring current but only performing voltammetry of various types. In fact, elected claim 29 of the parent application required measuring current. Another example is claim 46 of the instant application, which requires that the sensor be integrated into a channel. Non-elected Group II (claims 21-26) of the parent

Art Unit: 1743

application did not require the sensor be integrated into a channel, but elected claim 31 of the parent application did.

Duplicate Claims under 37 CFR 1.75

The objections to claims 39 and 40 as being substantial duplicates of claims 34 and 36, respectively, are withdrawn.

Claim Objection for Informality

The objection to claim 36 is withdrawn.

Claim Rejections under 35 U.S.C. § 112

The rejections of claims 34-48 under 35 U.S.C. § 112 are withdrawn.

Claim Rejections under 35 U.S.C. §102

The rejections under 35 U.S.C. § 102 of claims 34, 38, 39, and 41-43 as clearly anticipated by Thormann et al. are withdrawn. A set of alternative 35 U.S.C. § 103 rejections based on Thormann et al. is now also applied. Thormann et al. teach that there is only “a small mutual interaction between adjacent sensing elements” for array I in Table II (first paragraph in first column on page 2767, which is continued from page 2766). A “small mutual interaction”

Art Unit: 1743

application did not require the sensor be integrated into a channel, but elected claim 31 of the parent application did.

Duplicate Claims under 37 CFR 1.75

The objections to claims 39 and 40 as being substantial duplicates of claims 34 and 36, respectively, are withdrawn.

Claim Objection for Informality

The objection to claim 36 is withdrawn.

Claim Rejections under 35 U.S.C. § 112

The rejections of claims 34-48 under 35 U.S.C. § 112 are withdrawn.

Claim Rejections under 35 U.S.C. §102

The rejections under 35 U.S.C. § 102 of claims 34, 38, 39, and 41-43 as clearly anticipated by Thormann et al. are withdrawn. A set of alternative 35 U.S.C. § 103 rejections based on Thormann et al. is now also applied. Thormann et al. teach that there is only “a small mutual interaction between adjacent sensing elements” for array I in Table II (first paragraph in first column on page 2767, which is continued from page 2766). A “small mutual interaction”

Art Unit: 1743

implies no substantial overlap of diffusion layers as required by Applicant's claims. Furthermore, Thormann et al. teach that when the spacing between sensing electrodes is large then the "limiting dc currents of individual sensing elements are additive within experimental error" (first paragraph in first column on page 2767, which is continued from page 2766). Thus, it would have been obvious to space the sensing electrodes beyond the diffusion boundary layer to additive response from the sensing electrodes.

Claim Rejections under 35 U.S.C. §103

The rejections under 35 U.S.C. § 103 of claims 34-43 in which Sauer is the base reference are withdrawn.

The rejections under 35 U.S.C. § 103 of claims 34-43 in which Williams et al. is the base reference are essentially maintained. First, Applicant's claims do not require a plurality of *identical* microelectrodes (page 17 of Applicant's amendment) nor making simultaneous measurements with the plurality of microelectrodes. Indeed, claims 34, 42, 43, specifically require only making measurements with a single microelectrode.

Second, although Applicant is correct in pointing out that Williams et al. disclose an embodiment in which two or more sensing electrodes are purposely spaced to be within the diffusion boundary, so-called "interactive electrodes" (col. 4, ll. 7-21), in the paragraph which immediately follows the discussion of interactive sensing electrodes Williams et al. also disclose independent electrodes for *independent* verification of the sensing results (col. 4, ll. 22-27). One with ordinary skill in the art would understand that since interactive sensing electrodes are

Art Unit: 1743

sensing electrodes spaced within the diffusion boundary then independent electrodes must spaced beyond the diffusion boundary. It should be noted that Figure shows both interactive electrodes 50 and 52 and an independent electrode 56 (col. 7, ll. 58-60). Furthermore, Thormann et al. is relevant to Williams et al. independent electrodes embodiment since the article teaches in depth the importance of adequate spacing between the electrodes for independent measurements.

Last, Williams et al. also disclose an embodiment in which simultaneous measurements are made with a plurality of sensing electrodes to detect different analytes (col. 3, ll. 52-58). Clearly, it would have been obvious to have the different sensing electrodes widely separated to avoid interference and thus inaccuracies due to overlapping electrochemical reaction regions.

The rejections under 35 U.S.C. § 103 of claims 39, 42, and 43 as being obvious over Sauer in view of Thormann et al. and Kuhr et al. are withdrawn.

The rejections under 35 U.S.C. § 103 of claims 39, 42, and 43 as being obvious over Williams et al. in view of Thormann et al. in view of Kuhr et al. are withdrawn.

***Status of Allowable Claims and Objections and Rejections Pending Since
the Office Action of July 08, 2002***

3. All previous rejections and objections are withdrawn. However, as discussed above, several rejections have essentially just been rewritten to accommodate Applicant's amendment.

4. Allowable claims 44-48 are now rejected over newly found prior art.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claim 34 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claim 34 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

7. Claim 36 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical,

Art Unit: 1743

they are not patentably distinct from each other because the combination of Claims 3, 21, and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claim 36 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

8. Claims 38 and 39 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 31, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, and 31 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claims 38 and 39 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

9. Claims 38 and 40 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 32, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, and 32 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claims 38 and 40 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial

Art Unit: 1743

overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

10. Claims 38 and 41 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 33, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, and 33 of U.S. Patent No. 6,110,354 together include all of the limitations of Claims 38 and 41 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

11. Claims 38 and 42 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 30 of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, and 30 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claims 38 and 42 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

12. Claims 38 and 43 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 29 of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 21 and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claims 38 and 43 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

13. Claims 38 and 44 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 34 of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, and 34 of U.S. Patent No. 6,110,354 together include all of the limitations of claims 38 and 44 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

14. Claim 45 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 34, and 12, which all

Art Unit: 1743

depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, 34, and 12 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claim 45 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

15. Claims 46 and 47 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 31, and 16, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, 31, and 16 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claims 46 and 47 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

16. Claims 46 and 48 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 32, and 16 of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, 32, and 16 of U.S. Patent No. 6,110,354 together include all of the limitations of Claims 46 and 48 of the instant application. Note that having a

Art Unit: 1743

gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent

No. 6,110,354. See column 5, lines 23-26 of the instant application.

17. Claim 49 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 25, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, 25, and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claim 49 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

18. Claims 50 and 51 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of each of claims 50 and 51 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state

Art Unit: 1743

behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

19. Claims 52 and 53 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 3, 15, 21, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354 in view of page 533 of Handbook *of Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998. The combination of claims 3, 15, 21, and 29 meet all the claim limitations of each of claims 52 and 53 of the instant application except for an adhesion layer, particularly an adhesion layer comprising chromium. However, it is was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of the combination of claims 3, 15, 21, and 29 of U.S. Patent No. 6,110,354 because as taught by Mattox desirable conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

20. Claim 54 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 25, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3,

Art Unit: 1743

21, 25, and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claim 54 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

21. Claims 55 and 56 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, and 29 of U.S. Patent No. 6,110,354 together meet all of the limitations of each of claims 55 and 56 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

22. Claims 57 and 58 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 3, 15, 21, and 29, which all depend from claim 1, of U.S. Patent No. 6,110,354 in view of page 533 of *Handbook of Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998. The combination of claims 3, 15, 21, and 29 meet all the claim limitations of each of claims 57 and 58 of the instant

Art Unit: 1743

application except for an adhesion layer, particularly an adhesion layer comprising chromium. However, it is was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of the combination of claims 3, 15, 21, and 29 of U.S. Patent No. 6,110,354 because as taught by Mattox desirable conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

23. Claim 59 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 25, and 31, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, 25, and 31 of U.S. Patent No. 6,110,354 together meet all of the limitations of Claim 59 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

Art Unit: 1743

24. Claims 60 and 61 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, and 31, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, and 31 of U.S. Patent No. 6,110,354 together meet all of the limitations of each of claims 60 and 61 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

25. Claims 62 and 63 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 3, 15, 21, and 31, which all depend from claim 1, of U.S. Patent No. 6,110,354 in view of page 533 of *Handbook of Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998. The combination of claims 3, 15, 21, and 31 meet all the claim limitations of each of claims 62 and 63 of the instant application except for an adhesion layer, particularly an adhesion layer comprising chromium. However, it is was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of the combination of claims 3, 15, 21, and 29 of U.S. Patent No. 6,110,354 because as taught by Mattox desirable

Art Unit: 1743

conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

26. Claim 54 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 25, 32, and 16 of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 3, 21, 25, 32, and 16 of U.S. Patent No. 6,110,354 together include all of the limitations of Claim 54 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

27. Claims 65 and 66 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the combination of claims 3, 21, 25, 32, and 16, which all depend from claim 1, of U.S. Patent No. 6,110,354. Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 3, 21, 25, 32, and 16 of U.S. Patent No. 6,110,354 together meet all of the limitations of each of claims 65 and 66 of the instant application. Note that having a gap length between adjacent electrodes such that no substantial overlap of diffusion layers occurs is inherent when there is steady-state behavior as required by Claim 21 of U.S. Patent No. 6,110,354. See column 5, lines 23-26 of the instant application.

Art Unit: 1743

28. Claims 67 and 68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 3, 21, 25, 32, and 16, which all depend from claim 1, of U.S. Patent No. 6,110,354 in view of page 533 of Handbook of *Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998. The combination of claims 3, 21, 25, 32, and 16 meet all the claim limitations of each of claims 67 and 68 of the instant application except for an adhesion layer, particularly an adhesion layer comprising chromium. However, it was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of the combination of claims 3, 21, 25, 32, and 16 of U.S. Patent No. 6,110,354 because as taught by Mattox desirable conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

Claim Rejections - 35 USC § 103

29. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1743

30. Claims 34, 38, 39, 41, 50-52, and 60-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770).

Addressing Claim 34, Thormann et al. teach a method of utilizing a band electrode array sensor comprising

a substrate having a first edge (Figure 2);

a layer of insulating material on top of the substrate, the layer of insulating material having a first edge (E' in Figure 2);

the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figure 2);

a plurality of band electrodes between the substrate and the layer of insulating material, a surface of each of the band electrodes exposed at the single edge (M' in Figure 2), wherein the exposed surface of each of said microband electrodes has a width less than about 25 micrometers and a thickness less than about 25 micrometers (array I in Table II); and

a plurality of gaps, one gap between each of two adjacent band electrodes, the method comprising the steps of

(a) contacting the sensor with a sample suspected of containing an analyte ("Results and Discussion" on page 2766); and

(b) scanning the voltage from a negative voltage to a positive voltage such that the scanned voltage is of a range where the analyte should be oxidized or reduced at the microband electrode (Figure 3).

Thormann et al. do not specifically mention that the gap has a length great enough for no *substantial* overlap of diffusion layers; however, this limitation is arguably implied by the teaching that with a 30 μm gap length there is only a small interaction between adjacent sensing elements (first column on page 2767). In any event Thormann et al. also teach that with a large gap length the response at each sensing element becomes additive within experimental error (first column on page 2767). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have the gap length large enough so that the response at each sensing element becomes additive within experimental error; that is, there is no substantial overlap of diffusion layers, because then the overall response of the sensing elements will be directly proportional to the concentration of analyte. The overall sensor response will not have to be corrected for inaccuracy due to overlapping diffusion layers.

Addressing Claim 38, Thormann et al. teach a method of detecting the presence and measuring the concentration of analytes in a sample, the method comprising the steps of

- (a) contacting a microband electrode array sensor comprising
 - a substrate having a first edge (Figure 2);
 - a layer of insulating material on top of the substrate, the layer of insulating material having a first edge ('E' in Figure 2);
 - the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figure 2);
 - a plurality of microband electrodes between the substrate and the layer of insulating material, a surface of each of the band electrodes exposed at the single edge ('M' in Figure 2),

Art Unit: 1743

wherein the exposed surface of each of said microband electrodes has a width less than about 25 micrometers and a thickness less than about 25 micrometers (array I in Table II); and

a plurality of gaps, one gap between each of two adjacent band electrodes;

with a sample suspected of containing an analyte (‘Results and Discussion’ on page 2766);

(b) applying an electrical potential to the sensor (‘Results and Discussion’ on page 2766 and Figure 3); and

(c) measuring the electrical current flowing through the sensor (y-axis in Figure 3 is current).

Thormann et al. do not specifically mention that the gap has a length great enough for no *substantial* overlap of diffusion layers; however, this limitation is arguably implied by the teaching that with a 30 μm gap length there is only a small interaction between adjacent sensing elements (first column on page 2767). In any event Thormann et al. also teach that with a large gap length the response at each sensing element becomes additive within experimental error (first column on page 2767). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have the gap length large enough so that the response at each sensing element becomes additive within experimental error; that is, there is no substantial overlap of diffusion layers, because then the overall response of the sensing elements will be directly proportional to the concentration of analyte. The overall sensor response will not have to be corrected for inaccuracy due to overlapping diffusion layers.

Addressing Claim 39, cyclic voltammetry is disclosed in Figure 2.

Addressing Claim 41, applying an electrical potential to the sensor and measuring the electrical current flowing through the sensor is disclosed by Figure 2.

Addressing Claims 50, 51, 60, and 61, the thickness of array I in Table II is 0.1 micrometer.

Addressing Claims 52 and 62, although layer (E) was taken to be the insulating layer in the rejection of claim 34, alternatively layer (D) can be the insulating and layer (E) will then be the adhesion layer (see Figure 2 and the first two sentences in the second full paragraph in the first column on page 2766).

31. Claims 34 and 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), Mochizuki et al. (US 3,530,046), and Kuhr et al. (US 5,958,215).

Addressing Claim 34, Williams et al. teach a method of utilizing a band electrode array sensor of the kind comprising

a substrate having a first edge (element 10 in Figure 6);

a layer of insulating material on top of the substrate, the layer of insulating material having a first edge (element 60 in Figure 6);

the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figures 5 and 6);

Art Unit: 1743

a plurality of band electrodes between the substrate and the layer of insulating material, a surface of each of the band electrodes exposed at the single edge (elements 50 and 56 in Figure 6); and

a plurality of gaps, one gap between each of two adjacent band electrodes, the method comprising the step of

contacting the sensor with a sample suspected of containing an analyte (implied by col. 11, ll. 19-20, which teaches measuring chlorine concentration).

Williams et al. do not mention that the band electrodes have a width less than 25 micrometers and a thickness less than about 25 micrometers (although note 1 micrometer thick electrodes disclosed in col. 9, ll. 34-36). Mochizuki et al. and Thormann et al. show that it was known at the time of the invention how make electrodes within applicant's claimed dimension ranges (col. 3, ll. 63-66 and Claims 2 and 3 in Mochizuki et al. and array I in Table II of Thormann et al.). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have each microband electrode have a width less than 25 micrometers and a thickness less than about 25 micrometers as taught by Mochizuki et al. and Thormann et al. in the invention of Williams et al. because then the sensor will be small and compact and useful even if only small amounts of sample are available.

Williams et al. also do not mention that that the gaps between the electrodes are sufficiently large to prevent substantial overlap of diffusion layers; however, Williams et al. arguably imply gap lengths large enough to prevent substantial overlap of diffusion layers because they teach that interactive electrodes, unlike independent electrodes, are designed so that the electrodes are spaced close enough for substantial overlap of diffusion layers (col. 4, ll. 7-27

Art Unit: 1743

and col. 1, ll. 15-29). Furthermore, as shown by Thormann et al. it was known at the time of the invention that if sensing electrodes are too closely spaced together inaccuracies in the measurement will result (last paragraph in the second column of page 2766 bridging to page 2767). Thus it would have been obvious to one with ordinary skill in the art at the time the invention was made to have gaps between the electrodes large enough to prevent substantial overlap of diffusion layers as taught by Thormann et al. in the invention of Williams et al. as modified by Mochizuki et al. and Thormann et al. because such gap lengths will avoid measurement inaccuracies such as non-steady-state currents due to diffusion effects.

Williams finally do not mention scanning the voltage as claimed.

Kuhr et al. teach sinusoidal voltammetry (the abstract). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use sinusoidal voltammetry as taught by Kuhr et al. in the invention of Williams et al. as modified by Mochizuki et al. and Thormann et al. because as taught by Kuhr et al. sinusoidal voltammetry can be more sensitive for nucleotide or nucleic acid analysis than traditional electrochemical techniques (col. 2, ln. 55–col. 3, ln. 25).

Addressing Claim 49, Williams et al. disclose a silicon nitride or silicon dioxide insulating layer in col. 4, ll. 46-53.

Addressing Claims 50 and 51, the thickness of array I in Table II of Thormann et al. is 0.1 micrometer. Again, Applicant's claimed dimensions are just a matter of scaling the sensor to the expected sample size or size of the sampling region.

Art Unit: 1743

32. Claims 36, and 55-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770) in view of Wojciechowski et al. (US 5,873,990).

Addressing Claim 36, Thormann et al. teach a method of utilizing a band electrode array sensor comprising

a substrate having a first edge (Figure 2);

a layer of insulating material on top of the substrate, the layer of insulating material having a first edge (E' in Figure 2);

the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figure 2);

a plurality of band electrodes between the substrate and the layer of insulating material, a surface of each of the band electrodes exposed at the single edge (M' in Figure 2), wherein the exposed surface of each of said microband electrodes has a width less than about 25 micrometers and a thickness less than about 25 micrometers (array I in Table II); and

a plurality of gaps, one gap between each of two adjacent band electrodes, the method comprising the step of

(a) contacting the sensor with a sample suspected of containing an analyte ('Results and Discussion' on page 2766).

(b) scanning the voltage from a negative voltage to a positive voltage such that the scanned voltage is of a range where the analyte should be oxidized or reduced at the microband electrode (Figure 3).

Thormann et al. do not specifically mention that the gap has a length great enough for no *substantial* overlap of diffusion layers; however, this limitation is arguably implied by the teaching that with a 30 μm gap length there is only a small interaction between adjacent sensing elements (first column on page 2767). In any event Thormann et al. also teach that with a large gap length the response at each sensing element becomes additive within experimental error (first column on page 2767). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have the gap length large enough so that the response at each sensing element becomes additive within experimental error; that is, there is no substantial overlap of diffusion layers, because then the overall response of the sensing elements will be directly proportional to the concentration of analyte. The overall sensor response will not have to be corrected for inaccuracy due to overlapping diffusion layers.

Thormann et al. do not disclose anodic stripping voltammetry, although they do disclose cyclic voltammetry (Figure 3). Wojciechowski et al. teach performing anodic stripping voltammetry (the abstract and col. 2, ll. 21-27; col. 8, ln. 64–col. 9, ln. 3; and col. 26, ll. 61-67). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use anodic stripping voltammetry as taught by Wojciechowski et al. in the invention of Thormann et al. because as taught by Wojciechowski et al. the sensor will then be capable of high sensitivity monitoring of metal ions.

Addressing Claims 55 and 56, the thickness of array I in Table II is 0.1 micrometer.

Art Unit: 1743

Addressing Claim 57, although layer (E) was taken to be the insulating layer in the rejection of claim 34, alternatively layer (D) can be the insulating and layer (E) will then be the adhesion layer (see Figure 2 and the first two sentences in the second full paragraph in the first column on page 2766).

33. Claims 36, 55, and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), Mochizuki et al. (US 3,530,046), and Wojciechowski et al. (US 5,873,990).

Addressing Claim 36, Williams et al. teach a method of utilizing a band electrode array sensor of the kind comprising

- a substrate having a first edge (element 10 in Figure 6);

- a layer of insulating material on top of the substrate, the layer of insulating material having a first edge (element 60 in Figure 6);

- the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figures 5 and 6);

- a plurality of band electrodes between the substrate and the layer of insulating material, a surface of each of the band electrodes exposed at the single edge (elements 50 and 56 in Figure 6); and

- a plurality of gaps, one gap between each of two adjacent band electrodes, the method comprising the step of

- contacting the sensor with a sample suspected of containing an analyte (implied by

Art Unit: 1743

col. 11, ll. 19-20, which teaches measuring chlorine concentration).

Williams et al. do not mention that the band electrodes have a width less than 25 micrometers and a thickness less than about 25 micrometers (although note 1 micrometer thick electrodes disclosed in col. 9, ll. 34-36). Mochizuki et al. and Thormann et al. show that it was known at the time of the invention how make electrodes within applicant's claimed dimension ranges (col. 3, ll. 63-66 and Claims 2 and 3 in Mochizuki et al. and array I in Table II of Thormann et al.). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have each microband electrode have a width less than 25 micrometers and a thickness less than about 25 micrometers as taught by Mochizuki et al. and Thormann et al. in the invention of Williams et al. because then the sensor will be small and compact and useful even if only small amounts of sample are available.

Williams et al. also do not mention that that the gaps between the electrodes are sufficiently large to prevent substantial overlap of diffusion layers; however, Williams et al. arguably imply gap lengths large enough to prevent substantial overlap of diffusion layers because they teach that interactive electrodes, unlike independent electrodes, are designed so that the electrodes are spaced close enough for substantial overlap of diffusion layers (col. 4, ll. 7-27 and col. 1, ll. 15-29). Furthermore, as shown by Thormann et al. it was known at the time of the invention that if sensing electrodes are too closely spaced together inaccuracies in the measurement will result (last paragraph in the second column of page 2766 bridging to page 2767). Thus it would have been obvious to one with ordinary skill in the art at the time the invention was made to have gaps between the electrodes large enough to prevent substantial overlap of diffusion layers as taught by Thormann et al. in the invention of Williams et al. as

Art Unit: 1743

modified by Mochizuki et al. and Thormann et al. because such gap lengths will avoid measurement inaccuracies such as non-steady-state currents due to diffusion effects.

Williams et al. as modified by Thormann et al. and Mochizuki et al. do not disclose anodic stripping voltammetry, although they do disclose cyclic voltammetry (Figure 3 of Thormann et al.). Wojciechowski et al. teach performing anodic stripping voltammetry (the abstract and col. 2, ll. 21-27; col. 8, ln. 64–col. 9, ln. 3; and col. 26, ll. 61-67). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use anodic stripping voltammetry as taught by Wojciechowski et al. in the invention of Williams et al. as modified by Thormann et al. and Mochizuki et al. because as taught by Wojciechowski et al. the sensor will then be capable of high sensitivity monitoring of metal ions.

Addressing Claims 55 and 56, the thickness of array I in Table II of Thormann et al. is 0.1 micrometer. Again, Applicant's claimed dimensions are just a matter of scaling the sensor to the expected sample size or size of the sampling region.

34. Claims 38, 39, 41, 44, 45, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), and Mochizuki et al. (US 3,530,046).

Addressing Claim 38, Williams et al. teach a method of detecting the presence and measuring the concentration of analytes in a sample, the method comprising the steps of

Art Unit: 1743

- (a) contacting a microband electrode array sensor comprising
 - a substrate having a first edge (element 10 in Figure 6);
 - a layer of insulating material on top of the substrate, the layer of insulating material having a first edge (element 60 in Figure 6);
 - the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figures 5 and 6);
 - a plurality of band electrodes between the substrate and the layer of insulating material, a surface of each of the band electrodes exposed at the single edge (elements 50 and 56 in Figure 6); and
 - a plurality of gaps, one gap between each of two adjacent band electrodes;
- with a sample suspected of containing an analyte (implied by col. 11, ll. 19-20, which teaches measuring chlorine concentration);
- (b) applying an electrical potential to the sensor (Figure 7), and;
- (c) measuring the electrical current flowing through the sensor (Figure 7).

Williams et al. do not mention that the band electrodes have a width less than 25 micrometers and a thickness less than about 25 micrometers (although note 1 micrometer thick electrodes disclosed in col. 9, ll. 34-36). Mochizuki et al. and Thormann et al. show that it was known at the time of the invention how make electrodes within applicant's claimed dimension ranges (col. 3, ll. 63-66 and Claims 2 and 3 in Mochizuki et al. and array I in Table II of Thormann et al.). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have each microband electrode have a width less than 25 micrometers and a thickness less than about 25 micrometers as taught by Mochizuki et al. and Thormann et al.

Art Unit: 1743

in the invention of Williams et al. because then the sensor will be small and compact and useful even if only small amounts of sample are available.

Williams et al. also do not mention that the gaps between the electrodes are sufficiently large to prevent substantial overlap of diffusion layers; however, Williams et al. arguably imply gap lengths large enough to prevent substantial overlap of diffusion layers because they teach that interactive electrodes, unlike independent electrodes, are designed so that the electrodes are spaced close enough for substantial overlap of diffusion layers (col. 4, ll. 7-27 and col. 1, ll. 15-29). Furthermore, as shown by Thormann et al. it was known at the time of the invention that if sensing electrodes are too closely spaced together inaccuracies in the measurement will result (last paragraph in the second column of page 2766 bridging to page 2767). Thus it would have been obvious to one with ordinary skill in the art at the time the invention was made to have gaps between the electrodes large enough to prevent substantial overlap of diffusion layers as taught by Thormann et al. in the invention of Williams et al. as modified by Mochizuki et al. and Thormann et al. because such gap lengths will avoid measurement inaccuracies such as non-steady-state currents due to diffusion effects.

Addressing Claim 39, Williams et al. do not mention cyclic voltammetry; however, as shown by Thormann et al. it was known to use cyclic voltammetry with microband electrodes at the time of the invention (Figure 3). Barring evidence to the contrary, such as unexpected results, the choice of measurement technique to use, such as cyclic voltammetry, will depend in the sample and the information required.

Addressing Claim 41, applying an electrical potential to the sensor and measuring the electrical current flowing through the sensor is shown in Figure 7 of Williams et al.

Addressing Claim 44, Williams et al. disclose a microband electrode array having an array of sensors separated from each other by insulating material in which additional sensors may be provided in an additional layer of insulating layer (Figures 5 and 6 and col. 3, ll. 35-47 and col. 12, ll. 35-45). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have a plurality of layers of microband electrodes separated from each other by insulating material as taught by Williams et al. in the invention of Williams et al. as modified by Mochizuki et al. and Thormann et al. because then the sensor will not be too wide. By stacking the electrode arrays the height of the sensor will, of course, increase, but not at the same rate as if the electrodes were all kept in the same insulating layer.

Addressing Claim 45, as seen in Figure 6 of Williams et al. the multi-layer microband electrode sensor is planar.

Addressing Claim 59, Williams et al. disclose a silicon nitride or silicon dioxide insulating layer in col. 4, ll. 46-53.

Addressing Claims 60 and 61, the thickness of array I in Table II of Thormann et al. is 0.1 micrometer. Again, Applicant's claimed dimensions are just a matter of scaling the sensor to the expected sample size or size of the sampling region.

Art Unit: 1743

35. Claims 40 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770) as applied to claims 34, 38, 39, 41, 50-52, and 60-62 above, and further in view of Wojciechowski et al. (US 5,873,990).

Thormann et al. do not mention performing stripping voltammetry although they do teach cyclic voltammetry (Figure 3). Wojciechowski et al. teach performing anodic stripping voltammetry (the abstract and col. 2, ll. 21-27; col. 8, ln. 64–col. 9, ln. 3; and col. 26, ll. 61-67). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use anodic stripping voltammetry as taught by Wojciechowski et al. in the invention of Thormann et al. because as taught by Wojciechowski et al. the sensor will then be capable of high sensitivity monitoring of metal ions.

36. Claims 40 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), and Mochizuki et al. (US 3,530,046) as applied to claims 38, 39, 41, 44, and 59-61 above, and further in view of Wojciechowski et al. (US 5,873,990). Williams et al. as modified by Thormann et al. and Mochizuki et al. do not mention performing stripping voltammetry, although they do teach cyclic voltammetry (Figure 3). Wojciechowski et al. teach performing anodic stripping voltammetry (the abstract and col. 2, ll. 21-27; col. 8, ln. 64–col. 9, ln. 3; and col. 26, ll. 61-67). It would have been obvious to one with ordinary skill in the art at the time the

Art Unit: 1743

invention was made to use anodic stripping voltammetry as taught by Wojciechowski et al. in the invention of Williams et al. as modified by Thormann et al. and Mochizuki et al. because as taught by Wojciechowski et al. the sensor will then be capable of high sensitivity monitoring of metal ions.

37. Claims 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770) as applied to claims 34, 38, 39, 41, 50-52, and 60-62 above, and further in view of newly cited De Castro et al. (US 5,873,990).

Thormann et al. do not mention performing cathodic stripping voltammetry although they do teach cyclic voltammetry (Figure 3). De Castro et al. discloses performing anodic or cathodic stripping voltammetry (col. 2, ln. 54–col. 3, ln. 48 and col. 5, ll. 10-49). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use anodic stripping voltammetry or cathodic stripping voltammetry as taught by DeCastro et al. in the invention of Thormann et al. because at the time of the invention these techniques were known to be useful for detecting small inorganic and organic ions.

38. Claims 40 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), and Mochizuki et al. (US 3,530,046) as applied to claims 38, 39, 41, 44, 59-61

Art Unit: 1743

above, and further in view of newly cited De Castro et al. (US 5,873,990). Williams et al. as modified by Thormann et al. and Mochizuki et al. do not mention performing anodic or cathodic stripping voltammetry, although they do teach cyclic voltammetry (Figure 3 of Thormann et al.). De Castro et al. discloses performing anodic or cathodic stripping voltammetry (col. 2, ln. 54–col. 3, ln. 48 and col. 5, ll. 10–49). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use anodic stripping voltammetry or cathodic stripping voltammetry as taught by DeCastro et al. in the invention of Williams et al. as modified by Thormann et al. and Mochizuki et al. because at the time of the invention these techniques were known to be useful for detecting small inorganic and organic ions.

39. Claims 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764–2770) as applied to claims 34, 38, 39, 41, 50–52, and 60–62 above, and further in view of Williams et al. (US 5,460,710).

Addressing Claim 44, Thormann et al. do not mention having a plurality of layers of microband electrode array sensors separated from each other by insulating material. Williams et al. disclose a microband electrode array having an array of sensors separated from each other by insulating material in which additional sensors may be provided in an additional layer of insulating layer (Figures 5 and 6 and col. 3, ll. 35–47 and col. 12, ll. 35–45). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have a plurality of layers of microband electrodes separated from each other by insulating material as taught by Williams et al. in the invention of Thormann et al. because then the sensor will not be

Art Unit: 1743

too wide. By stacking the electrode arrays the height of the sensor will, of course, increase, but not at the same rate as if the electrodes were all kept in the same insulating layer.

Addressing Claim 45, as seen in Figure 6 of Williams et al. the multi-layer microband electrode sensor is planar.

40. Claims 46 and 65-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over newly cited Slater et al. (WO 95/10040 A1) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770).

Addressing Claim 46, Slater et al. teach a method for performing electrochemical measurements on a sample (the abstract) comprising the step of contacting a sample suspected of containing an analyte with a microband electrode array sensor comprising

- a substrate having a first edge (Figure 2);

- a layer of insulating material on top of the substrate, the layer of insulating material having a first edge (page 5, lines 11-20);

- the first edge of the substrate and the first edge of the insulating material aligned to form a single edge (Figure 2);

- a plurality of microband electrodes between the substrate and the layer of insulating material, a surface of each the microband electrodes exposed at the single edge (page 5, lines 21-28 and Figure 3); and

- a plurality of gaps, one gap between each of two adjacent microband electrodes (page 5, lines 21-28 and Figure 3); and

wherein the sensor is integrated into a channel (Figure 3).

Slater et al. do not mention that the gaps have lengths great enough for no *substantial* overlap of diffusion layers. Thormann et al. teach a microband electrode array having large enough gap lengths so that the response at each sensing element becomes additive within experimental error (first column on page 2767). It would have been obvious to one with ordinary skill in the art at the time the invention was made to have the gap lengths large enough so that the response at each sensing element becomes additive within experimental error; that is, there is no substantial overlap of diffusion layers, as taught by Thormann et al. in the invention of Slater et al. because then the overall response of the sensing elements will be directly proportional to the concentration of analyte. The overall sensor response will not have to be corrected for inaccuracy due to overlapping diffusion layers. Alternatively, if each sensing electrode is to perform a different measurement then by having sufficiently large gaps each measurement will be truly independent and thus more accurate.

Addressing Claims 65 and 66, Slater et al. do not mention having the thickness of the electrodes within the claimed ranges however, they do disclose having the widths of the electrodes range from 0.1 micrometers to 50 micrometers which includes most of the range of Applicant's claim 65 and all of the range of Claim 66. Thormann et al. teach electrodes with a thickness of 0.1 micrometer (array I in Table II). Barring evidence to the contrary, such as unexpected results, since Slater et al. disclose electrodes with a width down to 0.1 micrometer and Thormann et al. disclose electrodes down to 0.1 micrometer in thickness, having the electrodes

Art Unit: 1743

within Applicant's claimed thickness ranges is then just a matter of scaling the electrodes to fit into the desired sensing region.

Addressing Claims 67 and 68, Slater et al. disclose an adhesion layer in page 4, lines 19-26. A chromium adhesion layer is also disclosed in page 5, lines 1-4.

41. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Slater et al. (WO 95/10040 A1) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770) as applied to claims 46, 65, and 66 above, and further in view of Kuhr et al. (US 5,958,215). Slater et al. do not mention cyclic voltammetry, although a time-varying potential signal is used (page 6, lines 5-7). Kuhr et al. teach a cyclic voltammetric technique that may be used in capillary electrophoresis (the abstract). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use cyclic voltammetry as taught by Kuhr et al. in the invention of Slater et al. as modified by Thormann et al. because the technique of Kuhr et al. is sensitive and especially suited for detecting DNA strands (col. 3, ll. 11-34).

42. Claims 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Slater et al. (WO 95/10040 A1) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-

Art Unit: 1743

2770) as applied to claims 46, and 65-68 above, and further in view of newly cited De Castro et al. (US 5,873,990). Slater et al. do not mention stripping voltammetry, although a time-varying potential signal is used (page 6, lines 5-7). De Castro et al. discloses performing anodic or cathodic stripping voltammetry (col. 2, ln. 54–col. 3, ln. 48 and col. 5, ll. 10-49). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use anodic stripping voltammetry or cathodic stripping voltammetry as taught by DeCastro et al. in the invention of Slater et al. as modified by Thormann et al. because at the time of the invention these techniques were known to be useful for detecting small inorganic and organic ions.

43. Claims 52 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), Mochizuki et al. (US 3,530,046), and Kuhr et al. (US 5,958,215) as applied to claims 39 and 49-51 above, and further in view of page 533 of *Handbook of Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998.

Williams et al. as modified by Thormann et al., Mochizuki et al., and Kuhr et al. do not teach an adhesion layer, particularly an adhesion layer comprising chromium, although Williams et al. do disclose copper and gold film electrodes (col. 3, ll. 10-51). It was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of Williams et al. as modified by Thormann et al.,

Art Unit: 1743

Mochizuki et al., and Kuhr et al. because as taught by Mattox desirable conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

44. Claims 57 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), Mochizuki et al. (US 3,530,046), and Wojciechowski et al. (US 5,873,990) as applied to claims 36, 55, and 56 above, and further in view of page 533 of *Handbook of Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998.

Williams et al. as modified by Thormann et al., Mochizuki et al., and Kuhr et al. do not teach an adhesion layer, particularly an adhesion layer comprising chromium, although Williams et al. do disclose copper and gold film electrodes (col. 3, ll. 10-51). It was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of Williams et al. as modified by Thormann et al., Mochizuki et al., and Wojciechowski et al. because as taught by Mattox desirable conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

Art Unit: 1743

45. Claims 62 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williams et al. (US 5,460,710) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770), and Mochizuki et al. (US 3,530,046) as applied to claims 38, 39, 41, 44, 45, and 59-61 above, and further in view of page 533 of *Handbook of Physical Vapor Deposition (PVD) Processing* by Donald Mattox, Noyes Publications, 1998.

Williams et al. as modified by Thormann et al. and Mochizuki et al. do not teach an adhesion layer, particularly an adhesion layer comprising chromium, although Williams et al. do disclose copper and gold film electrodes (col. 3, ll. 10-51). It was common at the time of the invention to provide an adhesion layer comprising chromium in thin-film microelectronic device, as shown by page 533 of Mattox. It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide an adhesion layer comprising chromium as taught by Mattox in the invention of Williams et al. as modified by Thormann et al. and Mochizuki et al. Wojciechowski et al. because as taught by Mattox desirable conducting materials such as gold and copper would otherwise poorly attach to the insulating substrate.

46. Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Slater et al. (WO 95/10040 A1) in view of Thormann et al. ("Voltammetry at Linear Gold and Platinum Microelectrode Arrays Produced by Lithographic Techniques," Anal. Chem. 1985, 57, 2764-2770) as applied to claims 46, 65, and 66-68 above, and further in view of Williams et al.

Art Unit: 1743

(US 5,460,710). Slater et al. as modified by Thormann et al. do not disclose an insulating material selected from the claimed Markush group. Williams et al. disclose a microband electrode array having an insulating material made of silicon nitride or silicon dioxide (the abstract; Figure 6; and col. 4, ll. 46-53). It would have been obvious to one with ordinary skill in the art at the time the invention was made to use silicon nitride or silicon dioxide in the insulating layer as taught by Williams et al. in the invention of Slater et al. as modified by Thormann et al. because this would provide the optimum electrical and chemical resistance for some samples.

Drawings

47. The proposed drawing correction, filed on October 08, 2002 has been accepted. A PTO draftsman has made the proposed change to original Figure 6A submitted on August 29, 2000, so a corrected drawing is not needed.

48. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (703) 305-5686. The examiner can normally be reached on M-F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JILL WARDEN can be reached on (703) 308-4037. The fax phone numbers for the

Art Unit: 1743

organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Alex Noguerola
December 26, 2002


E. TUNG
PRIMARY PATENT EXAMINER
ART UNIT ~~112~~
1743